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CALOGLOSSA LEPRIEURII IN MOUNTAIN STREAMS

BY MARSHALL A. HOWE

In 1850, Dr. C. Montagne* described as new several species of red algae from mountain streams in French Guiana, referring three of them to the genus *Bostrychia*, one to *Gymnogongrus*, and one to *Ballia*; another species referred to the genus *Ballia* had already been described from the same region by Kützing. As the two last-named genera had been considered exclusively marine and as the members of the first-named, though typically inhabitants of brackish waters, were not elsewhere known to occur beyond the influence of the sea, Montagne naturally expressed surprise at the undoubted existence of these plants in running fresh water 40 kilometers or more from the sea and at altitudes ranging from 100 to 200 meters. But Montagne's species of *Gymnogongrus* has since become the monotype of a new genus *Sterrocladia*, placed in the fresh-water family Lemnaceae, and the three species of *Bostrychia* have been considered by J. G. Agardh to be forms of a single species, *B. Moritziana*, previously described from the Antilles. Little has apparently been added to our knowledge of the two species referred to *Ballia*.

In the winter of 1890-'91, Professor K. Goebel collected four species of red algae—*Caloglossa Leprieurii* (Mont.) J. Ag., *Catenella impudica* (Mont.) J. Ag., *Bostrychia Moritziana* (Sond.) J. Ag. and *Bostrychia Calliptera* Mont.—on the roots of mangroves at the mouth of the Barima, British Guiana.† The surrounding water had not the slightest saline taste. Later, one of these species, *Bostrychia Moritziana*, was collected by Goebel in an inland cataract, and he considers its occurrence inland and in fresh water at the mouth of a river as evidence that this plant of marine affinities has gradually accustomed itself to water less and less brackish until it has finally become able to thrive in pure fresh water at a considerable distance from the sea, thus

* Ann. Sci. Nat. III. 14 : 283.

† Flora, 83 : 436-444. 1897.

answering in a measure Montagne's query as to how the algae described by him came to be in the mountains of French Guiana. Goebel then inquires why, of the four species found by him in fresh water at the mouth of the river, only one, *Bostrychia Moritziana*, appears to have wandered up-stream, alluding, however, to the reported occurrence of *Caloglossa Leprieurii* far up the Hudson River [at West Point].* He remarks upon the incompleteness of our knowledge of the interesting stream-flora of Guiana and considers it not at all improbable that one or another of the three other species named, for example, the *Delesseria* [*Caloglossa*], may yet be found to have wandered inland. Already, however, nine years before Goebel's notes were published, Dr. Ferdinand Hauck had reported † the occurrence of *Caloglossa Leprieurii* on stones in a brook in the Sierra de Luquillo of Porto Rico. There, also, it was recollected on July 20, 1902, by Mr. Percy Wilson, of the New York Botanical Garden, who states that it was abundant on stones in a single stream but was not noticed in other streams of the region. The locality was about 12 kilometers from the sea, and the elevation, according to estimates by Mr. Wilson and by Professor A. W. Evans, of Yale University, may be conservatively placed at from 400 to 500 meters. The water, as would be expected, was entirely fresh to the taste. The specimens agree perfectly with those collected in the same mountains by Sintenis and referred to *Caloglossa Leprieurii* by Hauck. The species was originally described by Montagne‡ from two specimens collected in French Guiana, one growing on maritime rocks near Cayenne, the other creeping on culms of grasses reached by the high tide not far from the mouth of the river Sinnamari. The Porto Rican specimens are wholly sterile, so far as the writer can discover, and there seems to be no reliable way of distinguishing them specifically from a specimen of *Caloglossa Leprieurii* from Cayenne—evidently typical, if not an actual co-type—in the herbarium of Columbia Univer-

* Mr. George Skene, of the New York Botanical Garden, is authority for the statement that the water of the Hudson River at West Point is, at flood tide, decidedly salt to the taste.

† Engler's Bot. Jahrb. 9 : 461. 1888.

‡ Ann. Sci. Nat. II. 13 : 196. 1840.

sity. The Porto Rican fresh-water plants are, however, somewhat narrower and the cells are slightly larger. Adventitious branches from the dorsal surface at the nodes are found in plants from both regions, but are met with more frequently in those from Porto Rico.

Caloglossa Leprieurii, as commonly understood, has a wide distribution, ranging northward from South America to the Hudson River, occurring chiefly in tidal rivers. As collected about New York and at West Point, it is considerably narrower than the type, but does not seem to differ otherwise. Specimens taken at West Point were identified as "*Delesseria Leprieurii*" by Montagne himself according to a note by Professor J. W. Bailey in the Columbia University herbarium. What has been believed to be the same species has been attributed at various times to New Zealand, Ceylon, Calcutta, and other distant parts of the world. And three species of this genus, more or less resembling *C. Leprieurii*, have been described from fresh water, viz., *Caloglossa Beccarii* (Zanard.) De-Toni, from Borneo; *C. Amboinensis* (G. Karst.) De-Toni, from the island of Amboina; and *C. Zanzibariensis* (Goebel) De-Toni from Zanzibar. As all the other members of the family to which *Caloglossa* belongs are exclusively marine, so far as is known, it seems fair to assume that all the species or forms of this genus inhabiting pure fresh water have had a marine origin in times comparatively recent from the evolutionary point of view. Karsten,* in discussing his Amboina plant from this standpoint states that the streams in which he collected it (at an altitude, often of "mehrere hundert Fuss") have a rapid fall to the sea and offer a transition in salinity too abrupt to be readily overcome. Therefore, instead of assuming a direct wandering up-stream under conditions practically such as exist at present, he suggests the possibility that the plant has been lifted out of the ocean in the course of the elevation of the island itself. In Amboina, an abundance of coralline blocks at an altitude equal to that of the *Caloglossa* stand as witnesses that an elevation of the island has taken place. Goebel, however, in discussing the biological relations of *Bostrychia Moritziana*,

* Bot. Zeit. 49: 270. 1891.

assumes a direct migration inland, the plant becoming gradually accustomed to a decreasing salt-content of the water, and aquatic animals, birds, etc., being the agents by which dissemination up stream beyond the reach of the tide is accomplished.

Caloglossa Leprieurii has been made the subject of an able and detailed morphological monograph by the late Professor Cramer, of Zurich, based upon material from New York and Ceylon. It may be remarked incidentally that this plant is a most elegant object, from the pedagogical standpoint, for the demonstration and study of the development of a thallus from an apical cell.

A KEY TO THE NORTH AMERICAN SPECIES OF LACTARIUS—II *

BY F. S. EARLE

SUBSECTION PIPERATI

- | | |
|--|---------------------------------|
| 1. Milk white, changing to cream-color or yellow. | 2. |
| Milk white, unchanging. | 3. |
| 2. Pileus yellowish-white, tomentose; stipe solid, velvety. | <i>L. subvellerus</i> Pk. |
| Pileus yellowish flesh-color, spotted; stipe hollow, glabrous. | <i>L. chrysorrheus</i> Fr. |
| 3. Pileus white or whitish or tinted. | 6. |
| Pileus reddish-brown, 1–2.5 cm.; stipe white. | <i>L. parvus</i> Pk. |
| Pileus grayish-brown, with shades of lilac. | 4. |
| Pileus dark brown, fuliginous or umbrinous. | 5. |
| Pileus dark green, very acrid. | <i>L. atro-viridis</i> Pk. |
| 4. Lamellae distant, yellowish, not staining. | <i>L. pyrogalus</i> (Bull.) Fr. |
| Lamellae crowded, flesh-color, staining greenish. | <i>L. varius</i> Pk. |
| 5. Pileus convex-umbilicate, rivulose-floccose; stipe 2.5 cm. | <i>L. umbrinus</i> (Pers.) Fr. |
| Pileus infundibuliform, dry, not polished; stipe 3–8 cm. | <i>L. plumbius</i> (Bull.) Fr. |
| 6. Pileus villous or tomentose, at least on the margin. | 7. |
| Pileus glabrous. | 10. |
| 7. Lamellae crowded. | 8. |
| Lamellae distant. | 9. |
| 8. Pileus white, then orange, silky-villous. | <i>L. villosus</i> Clem. |
| Pileus white to pale ochraceous, glabrate, margin silky. | <i>L. involutus</i> Soppitt |
| 9. Pileus white, persistently tomentose; spores nearly smooth. | <i>L. vellerus</i> Fr. |
| Pileus white, often spotted, becoming glabrate; spores rough. | <i>L. deceptivus</i> Pk. |

* Continued from page 141.